REMARKS

Reconsideration of the above-identified application in view of the preceding amendments and the following remarks is respectfully requested.

Claims 1-2 and 4-31 remain in this application. Claims 32 and 33 have been withdrawn from consideration as being directed to non-elected subject matter. Claims 3 and 34-46 have been cancelled without prejudice, following the Advisory Action dated May 17, 2005. Claims 1, 10, 15 and 24 have been amended to more particularly point out and define the subject matter regarded as inventive. No new matter has been added to the subject application by these amendments, nor have any new issues been raised. Moreover, the claims have been amended herein to incorporate limitations that were already considered by the Examiner, as will be discussed in more detail hereinbelow.

CLAIM REJECTIONS

Claim Rejections - 35 U.S.C. §112

Claim 35 was rejected under 35 U.S.C. §112, first paragraph, because as a result of a typographical error, the stand off distance range (i.e., the distance from the nozzle head to the surface of the substrate) recited in Claim 35 was inconsistent with the stand off distance range set forth in the specification. By way of this Amendment, Claim 35 has been cancelled, thus obviating the rejection under 35 U.S.C. §112. However, this limitation has been incorporated into each of the pending independent claims so as to distinguish the subject invention over the prior art of record.

Claims 1-31 and 34-46 were rejected under 35 U.S.C. §112, first paragraph, because, the claims allegedly contain subject matter that was not described in the specification is such a

manner to enable one skilled in the art to practice the claimed invention. In particular, the Examiner took issue with the recitation involving the removal of a cold worked surface layer of the substrate by a water jet. However, it is respectfully submitted that the specification of the subject application provides an enabling disclosure of this recitation.

For example, the original specification of the subject application provides "a photograph of a superalloy turbine component wherein *the cold worked surface* of the component has been removed by high pressure water jet treatment . . . revealing the directionally solidified grain structure thereof," at page 8, lines 18-21 (emphasis added); "a photograph of another superalloy component wherein *the cold worked surface* of the component has been removed by high pressure water jet treatment . . . revealing the equi-axed grain structure thereof," at page 9, lines 1-3 (emphasis added); and that "the high pressure water jet removes *the cold worked surface* of the substrate and exposes the grain structure of the superalloy material to achieve the super micro-roughness," at page 11, lines 19-21 (emphasis added).

Thus, it is respectfully submitted that the specification of the subject application provides sufficient disclosure to enable one skilled in the art to practice the claimed invention. Nevertheless, in an effort to expedite prosecution of the subject application and without acquiescing in any way to this rejection, the claims have been amended, without prejudice, so as not to specifically refer to the cold worked surface of the superalloy substrate or the removal thereof by the high pressure water jet treatment. Accordingly, withdrawal of the rejection under 35 U.S.C. §112 is respectfully requested.

Claim Rejections - 35 U.S.C. §102

Claims 1-5, 9-11, 14, 38, 40 and 46 were rejected under 35 U.S.C. §102(b) over European Patent Publication EP 0 750 054 A1 to Taylor.

The Taylor '054 EP application discloses a method for surface erosion of superalloys employing a liquid jet. In particular, a liquid jet is employed to roughen the surface of a substrate so as to enable subsequent thermal spray coating material to adhere to the surface. According to Taylor '054 the "useful range of waterjet erosion of a substrate is when an adequate level of roughness has been obtained, with a minimum of substrate removal." (Page 3, lines 35-36). In order to achieve this goal, Taylor '054 teaches that the average thickness removal minimum is about 0.2 mils, which corresponds to about 4.5 mg/cm^2 of a typical superalloy surface, and the maximum thickness removal that can be accepted in about 2 mils, which corresponds to about 45 mg/cm^2 of erosion of the substrate surface. (See, Page 3, lines 41-45).

The Taylor '054 EP application discloses several experiments involving various superalloys. In these experiments, the superalloy substrates were subjected to a water jet delivered at various reservoir pressures (page 6, lines 9-10), and at various traverse speeds, including one specific example where the jet pressure was 50 ksi and the traverse rate was 30.5 cm/min (*i.e.*, 12 in/min) (See Page 5, lines 38-39). However, throughout these experiments, "the stand-off distance from the substrate surface to the water jet nozzle was 7.6 cm (3 inches), which was found to be the distance for "maximum erosion effect." (Page 5, lines 28-29). The Taylor EP application does not disclose any other stand-off distance whatsoever. Nor does this reference disclose that the defined stand-off distance can be varied in any way.

In contrast to the Taylor '054 EP application, Claims 1 and 10, as amended, define a method for applying a metallurgical coating to a superalloy substrate, which includes the step of directing a water jet having a pressure of about between 45,000 to 65,000 psi against the surface of the superalloy substrate while traversing the surface at a sweep rate of about between 25 to 100 inches per minute and at a stand-off distance of about between .375 to 1.00 inches, to modify the surface morphology of the substrate in such a manner so as to expose the underlying grain structure of the superalloy. The Taylor '054 EP application does not disclose or suggest a coating method that includes this step. Accordingly, Claims 1 and 10, and each of the remaining claims depending therefrom, are not anticipated by the Taylor '054 EP application. Claim 46 has been cancelled without prejudice, thus obviating the rejection as to that claim. Withdrawal of the rejection under 35 U.S.C. §102(b) as to the remaining claims is therefore respectfully requested.

Claim Rejections – 35 U.S.C. §103

Claims 7, 34-37, 39 and 41 were rejected under 35 U.S.C. §103(a) over European Patent Publication EP 0 750 054 A1 to Taylor.

Claim 7 depends from amended Claim 1 and thus includes all of the recitations set forth therein. As noted above, the Taylor '054 EP application fails to disclose or suggest the recitations of amended Claim 1, particularly the step of directing a water jet having a pressure of about between 45,000 to 65,000 psi against the surface of the superalloy substrate while traversing the surface at a sweep rate of about between 25 to 100 inches per minute and at a stand-off distance of about between .375 to 1.00 inches, to modify the surface morphology of the substrate in such a manner so as to expose the underlying grain structure of the superalloy.

Although, the '054 Taylor EP application discloses a range of reservoir pressures (*e.g.*, 30-50 ksi) and an exemplary traverse rate of 20.5 cm/min (12 in/min), Taylor only discloses one specific stand off distance that is used throughout the examples, *i.e.*, a stand off distance of 3.0 inches. In contrast, the stand-off distance defined by the amended claims of the subject application (.375 to 1.00 inches), is at least one-third of Taylor's stand off distance (*e.g.*, 1.0 inch vs. 3.0 inches). That is, the claimed invention describes a method wherein the nozzle is at least three times closer to the surface of the substrate than the nozzle utilized in Taylor's '054 EP application. Furthermore, the claimed invention describes a method wherein the nozzle traverse rate (25 to 100 inches per minute) is at least twice as fast as Taylor's traverse rate (25 in/min vs. 12 in/min). Given these differences, a person skilled in the art certainly would not have found the subject invention to be obvious in view of Taylor.

Indeed, it is Taylor's relatively slow traverse rate combined with his relatively great nozzle stand-off distance, that is effective in achieving his desired level of substrate removal by surface erosion, within the disclosed range of reservoir pressures. Alternatively, if one were to use the relatively slow traverse rate taught by Taylor and combine it with the relatively small nozzle stand-off distance claimed in the subject application, it is likely that the level of substrate removal achieved would far exceed the maximum levels desired by Taylor, within the disclosed reservoir pressure range. Similarly, if one were to use the relatively large stand off distance taught by Taylor and combine it with the relatively quick traverse rate claimed in the subject application, it is likely that the minimum level of substrate removal desired by Taylor would not be achieved, within the disclosed reservoir pressure range. Accordingly, Claim 7 is not rendered

obvious by Taylor's '054 EP application. Furthermore, Claims 34-37, 39 and 41 have been cancelled, thus obviating the rejection with respect thereto.

For each of these reasons, withdrawal of the rejection under 35 U.S.C. §103(a) over European Patent Publication EP 0 750 054 A1 to Taylor is respectfully requested.

Claims 6 and 12 were rejected under 35 U.S.C. §103(a) over Taylor's '054 EP application as applied to Claims 1-5, 9-11, 14, 38, 40 and 46 above, and further in view of U.S. Patent No. 5,956,845 to Arnold et al.

As noted above, the Taylor EP application fails to disclose or suggest a method that includes the step of directing a water jet having a pressure of about between 45,000 to 65,000 psi against the surface of the superalloy substrate while traversing the surface at a sweep rate of about between 25 to 100 inches per minute and at a stand-off distance of about between .375 to 1.00 inches, to expose the underlying grain structure of the superalloy, as recited in amended Claims 1 and 10, from which rejected Claims 6 and 12 depend, respectively.

Arnold et al. teach preparing a workpiece before a high density coating process by "cleaning, blasting, machining, masking or other like operations." (Col. 4, lns. 41-43). Arnold et al. fail to disclose or suggest the use of a high pressure water jet to modify the surface of a substrate so as to expose the underlying grain structure of the superalloy, as well as the operating parameters set forth in amended Claims 1 and 10. Thus, Arnold et al. do not overcome the deficiencies of Taylor's '054 EP application which were noted above. Moreover, neither reference discloses or suggests, either alone or in combination, the invention defined by Claims 6 and 12. Accordingly, Claims 6 and 12 are not rendered obvious by the combination of Taylor

'054 and Arnold et al., at least for the reasons set forth above with respect Claims 1 and 10. Withdrawal of the rejection under 35 U.S.C. §103(a) is therefore respectfully requested.

Claims 8 and 13 were rejected under 35 U.S.C. §103(a) over the Taylor '054 EP application as applied to Claims 1-5. 9-11, 14, 38, 40 and 46 above, and further in view of WO 02/40745.

Taylor's '054 EP application fails to disclose or suggest a method that includes the step of directing a water jet having a pressure of about between 45,000 to 65,000 psi against the surface of the superalloy substrate while traversing the surface at a sweep rate of about between 25 to 100 inches per minute and at a stand-off distance of about between .375 to 1.00 inches, as recited in amended Claims 1 and 10, from which rejected Claims 8 and 13 depend, respectively.

As for WO 02/40745, the English language abstract provided by the Examiner states, in its entirety, "[t]he invention relates to a material, in particular for a thermal insulation layer, with increased thermal stability, a low heat conductivity and a large thermal coefficient of expansion. According to the invention, said material comprises lanthanides, in particular the elements La, Ce, Nd, Yb, Lu, Er or Tm, which preferably occur as a mixture in a Perovskite structure. Said thermal insulation layer is particularly suitable for replacing thermal insulation layers comprising yttrium stabilized zirconium oxides (YSZ) as the thermal stability thereof is given as well over 1200 C."

Thus, to the extent that the English language portion of WO 02/40745 is cited, it fails to overcome the deficiencies of the '054 EP application to Taylor, in that it does not teach, at the very least, the combination of operational parameters set forth in the amended claims of the subject invention. Accordingly, Claims 8 and 13 are not rendered obvious by the combination of

Taylor's EP application and WO 02/40745, at least for the reasons set forth above with respect to amended Claims 1 and 10. Withdrawal of the rejection under 35 U.S.C. §103(a) is therefore respectfully requested.

Claims 15, 16, 18, 19, 22, 42 and 43 were rejected under 35 U.S.C. §103(a) over Taylor's '054 EP application as applied to Claims 1-5, 9-11, 14, 38, 40 and 46 and also Claims 7, 34-37, 39 and 41 above, and further in view of U.S. Patent No. 6,607,611 to Dariola.

Taylor's '054 application fails to disclose or suggest a two-layer coating method as recited in amended Claim 15 that includes the steps of directing a water jet having a pressure of about between 45,000 to 65,000 psi against the surface of a superalloy substrate while traversing the surface at a sweep rate of about between 25 to 100 inches per minute and at a stand-off distance of about between .375 to 1.00 inches, to modify the surface morphology of the substrate in such a manner so as to expose the underlying grain structure of the superalloy, depositing a first metallurgical coating layer onto the modified surface of the substrate by high velocity oxygen fuel spray, directing a water jet having a sufficient pressure against the surface of the first metallurgical coating layer for a sufficient time period to modify the surface morphology thereof, and depositing a second coating layer onto the modified surface of the first metallurgical coating layer.

Dariola teaches applying a bond coat layer to a superalloy substrate and then applying a ceramic layer over the bond coat layer. Dariola also teaches roughening the bond coat layer "by grit blasting" to better adhere with the ceramic layer. (Col. 6, lns. 10-20). Dariola does not disclose or suggest the combination of operational parameters defined in amended Claim 15, nor does Dariola disclose the use of high pressure water jet to roughen the second layer.

Furthermore, there is no suggestion within Dariola that high pressure water jet can be used to expose the underlying grain structure of the superalloy prior to applying the first coating layer.

In sum, neither Taylor '054 nor Dariola, disclose or suggest, either alone or in combination, in whole or in part, the invention defined by amended Claim 15. Accordingly, Claim 15 and Claims 16, 18, 19 and 22 which depend therefrom are not rendered obvious by the combination of references cited by the Examiner, and withdrawal of the rejection under 35 U.S.C. §103(a) is respectfully requested. Claims 42 and 43 have been cancelled.

Claims 17, 21, 23-27, 29-31 and 44-45 were rejected under 35 U.S.C. §103(a) over Taylor's '054 EP application in view of U.S. Patent No. 6,607,611 to Darolia as applied to Claims 15, 16, 18, 19, 22 and 42-43 above, and further in view of U.S. Patent No. 5,956,845 to Arnold et al.

As previously stated, Taylor's '054 EP application fails to disclose or suggest directing a water jet having a pressure of about between 45,000 to 65,000 psi against the surface of a superalloy substrate while traversing the surface at a sweep rate of about between 25 to 100 inches per minute and at a stand-off distance of about between .375 to 1.00 inches, to modify the surface morphology of the substrate in such a manner so as to expose the underlying grain structure of the superalloy, as recited in amended Claims 15 and 24. Dariola and Arnold et al. also do not disclose these operating parameters and thus they do not overcome the deficiencies of the '054 EP application. Accordingly, Claims 17, 21, 23-27 and 29-31, which depend from Claims 15 and 24, are not rendered obvious by the combination of references cited by the Examiner, and withdrawal of the rejection under 35 U.S.C. §103(a) with respect thereto is

respectfully requested. Claims 44-45 have been cancelled, since the limitations recited therein have been incorporated into amended Claim 24.

Claims 20 and 28 were rejected under 35 U.S.C. §103(a) over Taylor's '054 EP application in view of U.S. Patent No. 6,607,611 to Darolia and U.S. Patent No. 5,956,845 to Arnold et al. as applied to Claims 17, 21, 23-27, 29-31 and 44-45 above, and further in view of WO 02/40745.

Taylor's '054 application fails to disclose or suggest a coating method that includes the combination of operating parameters defined by Claims 15 and 24, from which rejected Claims 20 and 28 depend, specifically, directing a water jet having a pressure of about between 45,000 to 65,000 psi against the surface of a superalloy substrate while traversing the surface at a sweep rate of about between 25 to 100 inches per minute at a stand-off distance of about between .375 to 1.00 inches. Dariola, Arnold et al. and WO 02/40745 also do not disclose or suggest the claimed combination of operating parameters. Accordingly, Claims 20 and 28 are not rendered obvious by the combination of references cited by the Examiner, and withdrawal of the rejection under 35 U.S.C. §103(a) is respectfully requested.

CONCLUSION

It is respectfully submitted that each of the claims now pending in this application, namely Claims 1-2 and 4-31 are directed to patentable subject matter, and allowance thereof is earnestly solicited.

Respectfully submitted,

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